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An Addition to the Fauna of the United States, the Chihuahua Ridge-nosed Rattlesnake in New Mexico

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As early as 1850, members of the first Mexican Boundary Commission assembled collections of amphibians and reptiles. Since that early date, numerous collectors, attracted by the diversity of the fauna in portions of Texas, New Mexico, and Arizona where wooded mountain tops are surrounded by arid terrain, have worked in areas along the International Boundary. Several species with secretive or specialized habits seem nevertheless to have eluded collectors until recently. It is not astonishing that amphibians and reptiles, particularly those with distributions poorly known or disjunct in northern Mexico, prove to occur north of the boundary.

In view of the immense amount of study devoted to the rattlesnakes by L. M. Klauber prior to the publication of his monumental work in 1956, however, it seemed improbable that any additional representative of the genus *Crotalus* would be found in the United States. Thus the discovery of a colony of *Crotalus willardi silus* roughly 17 miles north of the International Boundary in the Animas Mountains of Hidalgo County, New Mexico, was unexpected, even though it represents a

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comparatively minor northward extension, little more than 90 miles beyond the range previously delineated by Klauber (1949, 1956).

The record is of zoogeographical interest, because it demonstrates the existence of an additional disjunct population in a subspecies limited to higher altitudes in a few isolated mountains near the northern extremity of its range. The occurrence of this rattlesnake within the United States may interest those preparing handbooks or check lists. In addition the present account provides an opportunity for the depiction of a living representative of this remarkably well-defined subspecies. The group of rattlesnakes to which it belongs is likely to be subjected to more detailed study as other isolated mountains on the Mexican Plateau become accessible to collectors. No live specimens were available to permit Klauber (1956) to illustrate the subspecies.

The nominate subspecies of *Crotalus willardi* has been known in the United States for over half a century. When Klauber described *Crotalus willardi silus* in 1949, however, the 26 specimens assigned to the race were from localities in northeastern Sonora and western Chihuahua. The record for the Santa María Mine in the Sierra del Tigre is scarcely 50 miles south of the International Boundary. In Chihuahua the few records for *C. w. silus* suggest that it is restricted to areas at the higher elevations along the crest of the Continental Divide. Klauber mapped the range as extending northward to the headwaters of the Río de Piedras Verdes at 6900 feet, roughly 75 miles in air-line distance south of New Mexico.

To the northwest *C. w. willardi* is thus far known from the Santa Rita and Huachuca Mountains in the United States, and from the Sierra de los Ajos, the Cerro Sierra Azul, and the Sierra Aconchi in northern Sonora, where Klauber (1956) reports it to be restricted to wooded areas in the pine-oak association at altitudes above 5000 feet. There are extensive areas of pine-oak woodland in the Chiricahua Mountains of extreme southeastern Arizona, but thus far *C. willardi* has not been taken in this range.

Similar habitats were known to exist in the Animas Mountains in restricted areas at higher elevations, where Animas Peak rises to an elevation of 8519 feet. During the summer of 1953 ranchers in the area mentioned having seen small, grayish colored rattlesnakes near the summit of these mountains. At that time it seemed more probable that these would prove to be *Crotalus pricei,* as Klauber (1934) once suggested. Like *Crotalus willardi silus, C. pricei* occurs in pine-oak woodlands along the Continental Divide in Chihuahua, but it ranges northward to the Pinaleño Mountains in Arizona. *Crotalus pricei* is moder-

ately abundant in suitable habitats in the Chiricahuas, but thus far it has not been taken in New Mexico or in the ranges adjacent to the boundary in Sonora and Chihuahua.

HABITAT IN THE UNITED STATES

Four specimens of *Crotalus willardi silus* from the Animas Mountains are now available. In 1957 Robert A. Zeller sent two living examples to the American Museum of Natural History, an adult female (A.M.N.H. No. 81796, fig. 3), taken a half mile east of Animas Peak at an elevation of 6875 feet, and an immature male (A.M.N.H. No. 79056, fig. 2), taken slightly to the southeast of the peak at an elevation of 7000 feet. Both specimens were obtained on September 15, the first at 12.30 P.M., and the second approximately an hour later. Both localities are in the upper end of Indian Creek Canyon, which drains northward along the eastern slopes of the main ridge, becoming diverted toward the northwest as a wash on the alluvial fan that drains into Animas Valley.

On October 30, 1960, the junior author, while working in the same area in Indian Creek Canyon, collected an immature female (field no. 2264) at an elevation of 6800 feet and a somewhat larger female, probably subadult (field no. 2265), at an elevation of 6900 feet. The first individual was found at 11.45 A.M.; the second, at 12.15 P.M.

It is problematical whether *Crotalus w. silus* is restricted to this limited area in the Animas Mountains. It will be noted that all four specimens were obtained in the fall, following the summer rains, at elevations within a relatively narrow zone between 6800 and 7000 feet. In September as well as during the latter part of October, 1960, when frost could be expected nearly every night, the snakes were encountered during the middle of the day. Zeller found the adult female in the leaf litter of a shaded area among the oaks in the floor of the canyon where few pines occurred. The immature male was also in the shade when discovered in a rocky area characterized by grass, pines, and juniper.

In 1960 the first individual was discovered among the leaves in a small outcrop of rocks that shielded the snake from direct sunlight. The second was taken on bare soil, dark brown in color, in the shade provided by shrubs below a rocky outcrop. The air temperature approximated 20° C., but in each instance the soil and the rocks adjacent to the snake were exposed to direct sunlight and probably warmer than the air.

The plants conspicuous in the vegetation of the area include the alligator juniper (*Juniperus deppiana*), the Mexican piñon pine (*Pinus cem-*

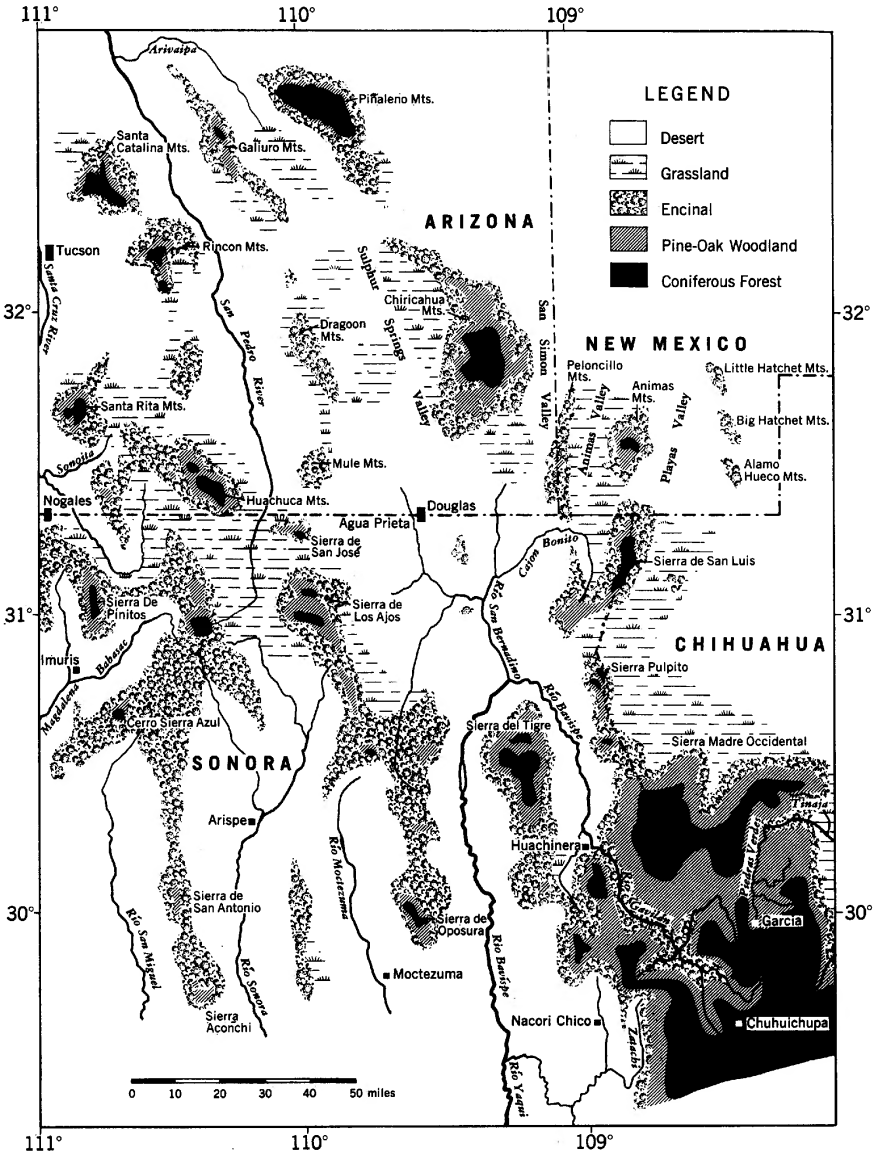

FIG. 1. Southwestern New Mexico and portions of the contiguous states of Arizona in the United States, and Sonora and Chihuahua in Mexico, showing the location of mountains and valleys mentioned in the text and the approximate distribution of desert, grassland, encinal (live oak), pine-oak woodland, and coniferous forest. Adapted from maps in the publication of Joe T. Marshall, Jr. (1957), with minor additions, as redrawn by Mr. Robert Gartland.

broides), the Chihuahua pine (*P. leiophylla*), the netleaf oak (*Quercus reticulata*), Gambel oak (*Q. gambelii*), and whiteleaf oak (*Q. hypoleucoides*), as well as a few Douglas fir (*Pseudotsuga taxifolia*). Various species of *Eriogonum* were abundant and in flower. Where the slopes are exposed, there are such grasses as *Sporobolus, Muhlenbergia,* and *Aristida.* At the elevations where *C. w. silus* was taken in Indian Creek Canyon, the slopes are steep but well forested, with humus abundant in the deep soil. There are scattered outcrops of rock but relatively few open areas where the grasses are dominant.

Thus the habitat in the Animas Mountains differs little from that Klauber (1956) describes for populations of *C. w. silus* in the mountains in Mexico, where the subspecies, like the nominate race, is primarily an inhabitant of the pine-oak forest. Klauber reports *C. w. silus* from altitudes of 5500 to 8000 feet in Chihuahua and Sonora. Marshall (1957) maps the distribution of pine-oak woodlands in southern Arizona, southwestern New Mexico, and the adjacent parts of Sonora and Chihuahua. It is probable that *C. w. silus* will be found in the Sierra de San Luis, which attain an altitude of 6751 feet where they extend across the International Boundary on the ridge that continues northward to form the Animas Mountains. The pine-oak woodland of the Sierra de San Luis, though more extensive than that of the Animas Mountains, as mapped by Marshall, is confined to the higher elevations south of the International Boundary.

Marshall indicates pine-oak woodland in the Sierra Pulpito farther south along the Continental Divide, with a smaller area of woodland between this range and the far more extensive pine-oak forests of the Sierra Madre Occidental. Presumably *C. w. silus* gained access to the Animas Mountains at some time in the past when there were no disjunctions in the pine-oak woodland along the Continental Divide. Similarly, *silus* must have gained access to the Sierra del Tigre from the southeast, via the ridge extending to the Sierra Madre, where the pine-oak woodland is now interrupted by grassland on the ridge west of Huachinera (Marshall, 1957).

It is somewhat more difficult to account for the similarity of the snakes in the various disjunct populations of *C. w. silus,* which are so readily distinguishable from those Klauber (1949, 1956) assigns to *C. w. willardi.* As far as present records indicate, the mountains inhabited by the nominate subspecies lie west of the Río Bavispe Valley at the headwaters of the Río Yaqui, the largest river in Sonora. If reliable inferences can be drawn from the samples available, therefore, it seems probable that the pine-oak woodland was interrupted in the lowlands

bordering the Río Bavispe long before such habitats became disjunct along the Continental Divide or in the outlying mountains connected to it east of the river. Similarly, pine-oak habitats must have been continuous, at least sporadically, in the higher mountains west of the valley, if we are to account for colonies of *C. w. willardi* in several mountains now isolated.

When closely related forms inhabit the mainland as well as islands off the coast, taxonomists sometimes are inclined to regard poorly differentiated populations of terrestrial animals restricted to one or more islands as distinct species. The decision seemingly stems from (1) the observation that insular populations cannot interbreed with those on the mainland, and (2) the assumption that once gene flow is interrupted and populations begin to diverge there is little likelihood that separate phyletic lines will converge.

Islands, particularly those not widely separated from the mainland, may, of course, regain connections to the mainland. Effective isolation mechanisms do not necessarily arise in the smaller insular population during prolonged periods of geographic isolation. Members of such populations may interbreed freely when contact with the mainland population is reëstablished. Where dichotomous differences exist in several characters, however, it is reasonable to assume that differentiation has reached the stage at which two species are represented. Morphological differentiation does not of necessity imply genetic incompatibility nor preclude the breakdown of ethological or ecological isolation mechanisms. In the absence of any better criteria, however, the systematist is usually forced to rely on the inferences he can draw from the nature and the extent of the morphological divergence revealed in his samples.

Populations isolated by disjunction in woodland habitats are quite as effectively isolated geographically as those on islands surrounded by water. In each instance individual populations are confined to limited areas where suitable environmental conditions prevail, and within which their members are restricted by the inhospitable environments surrounding the areas. There is often less basis for assuming an island to be permanently separated from the mainland than for assuming climatic conditions to be so stable that the vegetation on mountains will not revert, however slowly, to the conditions existing prior to disruptions in habitats formerly continuous.

Disjunctions in the habitats, such as those along the Continental Divide, are perhaps attributable in part to erosion, or to the dissection of elevated areas as streams cut more deeply into the Sierra Madre. There

can be little doubt, nevertheless, that climatic changes disrupt habitats more often than erosion or orogenic changes. Disjunctions in habitats and the fragmentation of populations of terrestrial vertebrates adapted to moderately specialized environments presumably play a major role in the isolation of populations, and hence also in speciation. Indirectly, therefore, climatic changes may have been responsible for much of the diversification encountered in such groups of animals, particularly at the generic, specific, and subspecific levels.

Though some taxonomists would regard the series of isolated populations referred to *Crotalus w. silus* as being specifically distinct from those of *C. w. willardi* on the western side of the Río Yaqui drainage, the systematic arrangement Klauber (1949, 1956) proposes is adequately as well as accurately indicative of relationships and the degree of divergence. Despite the hiatus in the distribution, the specimens of *C. w. silus* from the Animas Mountains conform closely to the description Klauber provides for specimens from Mexico, as noted in the ensuing section.

VARIATIONS IN THE SAMPLE FROM THE ANIMAS MOUNTAINS

The variations occurring in the small series comprised of a subadult male and an adult and two subadult females may be summarized as follows, with characters listed for the male separated by a semicolon. Lengths, from the snout to the base of the rattle, are 340; 470, 383, and 250 mm. The tail comprises 11.2 per cent of the over-all length of the male; 9.9, 8.3, and 8.4 in females. Scale rows 29–25–19, consistently 25 at mid-body, with minor variations that may depend on the method employed in the making of counts behind the head and anterior to the tail. There are 149; 155, 155, 156 ventrals. The subcaudals are 33; 30, 26, 25.

The scales on the head all fall within the variations reported by Klauber (1949). The supralabials range from 13 to 15, and there are similar counts and variations in the infralabials. The male has three loreals on each side, but the females have two, though it is a question on the two smaller specimens whether the upper one is a canthal or a loreal. There are two preoculars, with an additional scale present on the right side of the adult female.

The markings on the head and the dorsum of the body conform closely to Klauber's description, though the blotches on the body are gray, with a slight brownish cast, rather than dark brown, but darker

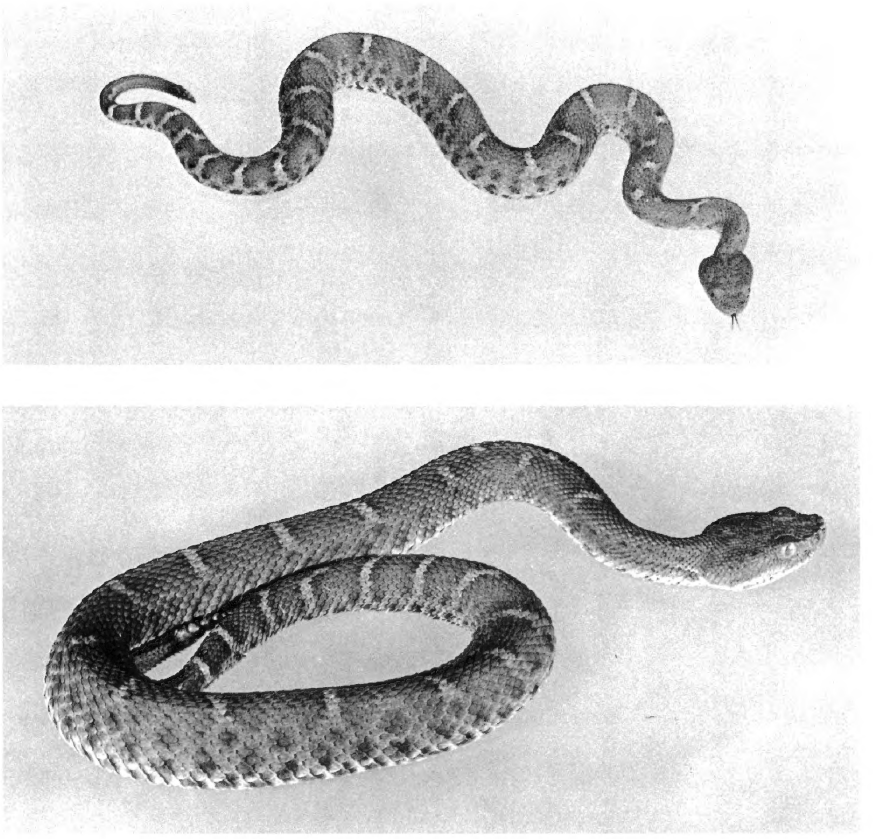

FIG. 2. Chihuahua ridge-nosed rattlesnake, *Crotalus willardi silus,* immature male, A.M.N.H. No. 79056, taken southeast of Animas Peak, at an altitude of 7000 feet in Indian Creek Canyon, Animas Mountains, Hidalgo County, New Mexico, on September 15, 1957, by Robert A. Zeller, Jr.

at each end, as Klauber describes them. They blend laterally with the faint, irregular mottling along the sides as shown in figures 2 and 3. The interspaces are ill defined, missing, or broken and asymmetrical on portions of the body. Thus counts of the number of blotches are little more than approximations, but on the three larger specimens there are from 20 to 25 blotches. The lighter interspaces are obscure on the anterior portion of the smallest individual, and other blotches are confluent; approximately 12, fewer than Klauber reports, are discernible in the preserved specimen. The smaller specimens are more conspicuously blotched on the sides than is the adult female. A dark

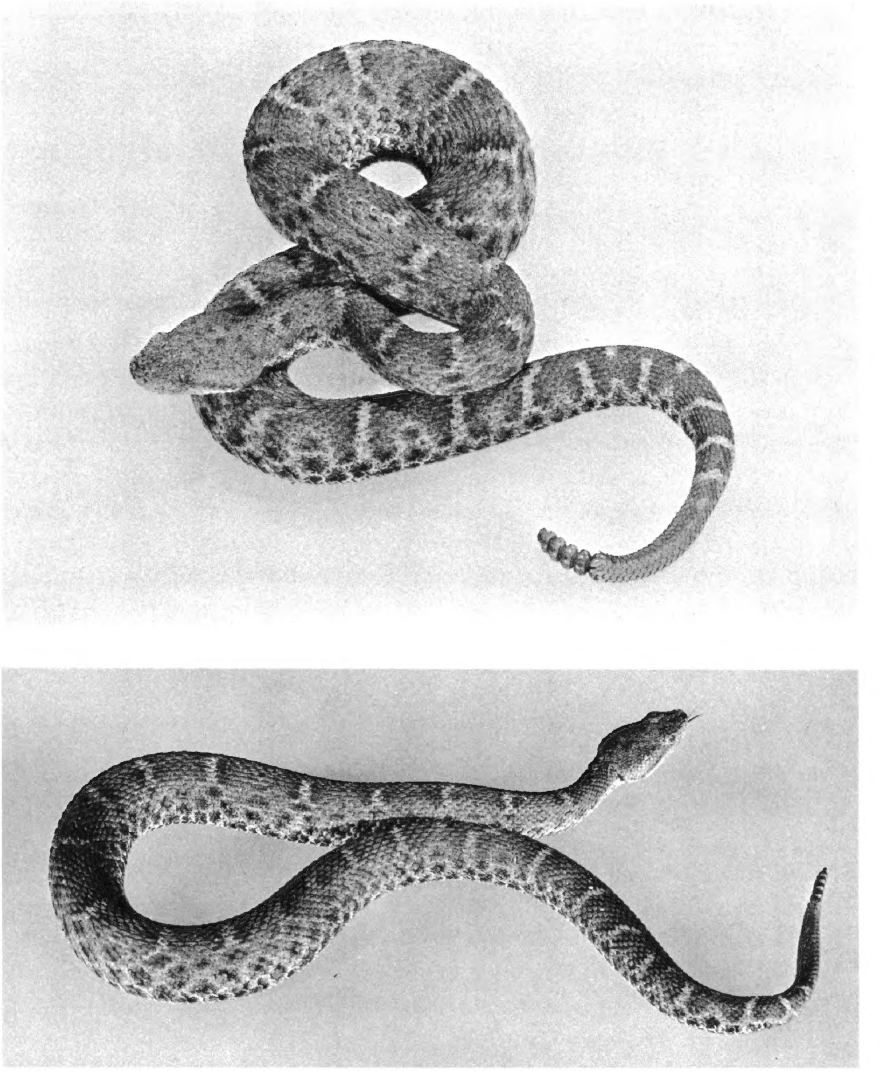

FIG. 3. Chihuahua ridge-nosed rattlesnake, *Crotalus willardi silus,* adult female, A.M.N.H. No. 81796, taken September 15, 1957, one-half mile east of Animas Peak, in Indian Creek Canyon, Animas Mountains, Hidalgo County, New Mexico, by Robert A. Zeller, Jr.

band bordering a lighter one below it extends forward and upward from the angle of the jaw, presumably representing a vestige of the sharply delineated stripes on the head of the nominate subspecies.

Nevertheless, there is not so much as a trace of the vertical light line through the rostral and mental scutes, the marking so characteristic of *C. w. willardi.*

Klauber reports the majority of the paratypes, as well as the type, to have 27 scale rows at mid-body, with 25 present on eight out of 26. The latter condition characterizes all four specimens from the Animas Mountains, but this situation could be fortuitous in a small sample. The smallest specimen is probably aberrant in having fewer blotches. Evidently the population in New Mexico differs little from other members of the race. Klauber observes that individuals from the Sierra del Tigre in Sonora are somewhat lighter than those from Chihuahua, which may account for the more nearly gray color of the population north of the boundary. Perhaps the paler hues of the populations in the Sierra del Tigre and Animas Mountains are associated with sparser vegetation and slightly more arid conditions in the disjunct habitats north of the Sierra Madre. Klauber observes that the pattern of *C. w. meridionalis,* an inhabitant of mountains to the south, in the states of Durango and Zacatecas, more closely resembles that of the nominate subspecies than that of *silus,* which occurs in the mountains of the intervening area.

FEEDING HABITS IN CAPTIVITY

Klauber (1956) reports an alligator lizard, *Gerrhonotus,* a small warbler, and mammal remains in the digestive tracts of preserved *Crotalus w. silus.* Lizards may comprise a large percentage of their diet under natural conditions. *Crotalus w. willardi* is known to prey upon *Sceloporus jarrovi,* the lizard most abundant in the habitat of *C. w. silus* in the Animas Mountains. An alligator lizard, *Gerrhonotus kingi,* is also present. *Urosaurus ornatus* occurs at lower altitudes in the range, and, like *Sceloporus undulatus virgatus,* it may inhabit open areas in the pine-oak woodland where *C. w. silus* might be expected to prey upon it occasionally.

The month following its capture the immature male of the Chihuahua ridge-nosed rattlers readily accepted albino mice. It survived for slightly less than four months, during which it ate six mice. The adult female taken by Zeller on September 15, 1957, survived until January 17, 1959. It first devoured a mouse on January 2, 1958, and consumed a total of 41 mice and one adult lizard (*Anolis carolinensis*) before it ceased feeding after eating two half-grown mice on November 21, 1958. It devoured one adult mouse per week when it first accepted food. It ate a mouse a day after it shed its skin on January 23, but it did not

resume eating again until April 2, 1958. It shed its skin again on April 7, but did not accept either mice or lizards until June 10. Thereafter it consumed either one adult mouse or as many as three small mice at intervals of approximately a week until a month and a half before it died.

DISTRIBUTIONS OF OTHER REPTILES IN HIDALGO COUNTY

Five other species of *Crotalus* inhabit the extreme southwestern corner of New Mexico. *Crotalus atrox* is the most abundant and widely distributed rattlesnake in the valleys and foothills. *Crotalus m. molossus* extends from the foothills to higher elevations. Zeller obtained specimens for the American Museum in the Peloncillo, Animas, Big Hatchet, and Alamo Hueco Mountains, all in the southern portion of Hidalgo County. The altitudinal range of *C. m. molossus* extends to at least 8000 feet in the Big Hatchet Mountains, and it probably occurs with the much smaller *C. w. silus* in the Animas Mountains. Another small rattler, *Crotalus lepidus klauberi,* is largely restricted to the mountains, though it is seldom encountered. Zeller obtained but two specimens, one in Bear Canyon, at 5650 feet, east of Animas Peak, and one at a similar elevation in Indian Creek where the junior author obtained a specimen at 5900 feet. It is improbable, nevertheless, that *C. l. klauberi,* primarily an inhabitant of rocky areas, occurs in the wooded habitat occupied by *C. w. silus.*

Two other rattlesnakes are largely restricted to the valleys but appear to be mutually exclusive in their distributions in Hidalgo County, as they commonly are to the west, where they often occupy contiguous areas. Zeller obtained specimens of *Crotalus v. viridis* at altitudes of 4400 and 4500 feet in Playas Valley to the east of the Animas Mountains, and several were taken in the same valley north of Hachita, in Grant County. *Crotalus v. viridis* has also been taken south of Animas, in Animas Valley, where *Crotalus scutulatus* is not encountered, though it is nearly as abundant as *C. atrox* in the San Simon Valley west of the Peloncillo Mountains. The situation is slightly different in the vicinity of Tucson, Arizona, where *Crotalus viridis cerberus* is encountered down to the foothills of the Santa Catalina Mountains but is replaced by *C. scutulatus* in the more open terrain of the valley. In northern Los Angeles County, California, the range of *Crotalus virdis helleri* extends from higher altitudes in the San Gabriel Mountains to the foothills bordering the western arm of the Mojave Desert, in Antelope Valley, where *C. scutulatus* inhabits the flat, sandy areas. The two species have

been taken a mile apart, but extensive work in the area failed to disclose any overlap in their distributions.

Inexplicably the altitudinal situation is reversed in northern Chihuahua. *Crotalus viridis viridis* is the only rattlesnake found in the sand dunes near Samalayuca, but the species is unknown to the south, where *C. scutulatus* is encountered as the terrain gradually rises along the road to the city of Chihuahua. In the vicinity of the Animas Mountains *C. v. viridis* is found in Playas Valley east of the divide, as well as in the Animas Valley on the western flank of the range. An older record for San Bernardino indicates its occurrence in the grassland to the south of the San Simon Valley in Arizona. *Crotalus atrox* is encountered throughout the lowlands of this region, but records for *C. s. scutulatus* and *C. v. viridis* provide no evidence that these two smaller species ever occur together.

The smaller rattlesnake, *Sistrurus catenatus edwardsi,* rarely encountered at best, remains unrecorded in the southwestern corner of New Mexico, from the Rio Grande westward, though it occurs in Arizona west of the Peloncillos (or the southern extremity of the range sometimes designated as the Guadalupe Mountains), in the vicinity of Douglas, as mapped by Gloyd (1955). Lowe (1956) correctly includes the species in a list of the rattlesnakes in the area contiguous to Hidalgo County in Arizona, where the Chiricahua and Dos Cabezas flank the western edge of the San Simon Valley. Lowe also lists *Crotalus cerastes* among the species in the area, despite the fact that the nearest authenticated record for the species is roughly a hundred miles to the west, beyond Tucson.

With the omission of *Crotalus cerastes,* but the inclusion of *Sistrurus catenatus,* therefore, eight species of rattlesnakes occur within the 40-mile radius west of Animas Peak, the approximate distance between the pine-oak woodlands inhabited by *C. w. silus* in the Animas Mountains and the similar habitat occupied by *C. p. pricei* in the Chiricahuas. Detailed plotting of the distributions of the eight species within the area reveals it to be improbable, nevertheless, that more than three of these species are likely to occur at any given locality. The situation can be attributed in part to the interplay of varying degrees of specialization in the species, as well as to the vagaries of climatic changes and their effects on dispersals. Such inferences as those drawn from our meager knowledge of feeding habits, temperature tolerances, moisture requirements, or other aspects of the physiology and behavior of the species suggest that competition between some, but not all, species may impose limitations on their distributions within the area. We lack pre-

cise information concerning the climatic history of the region and have no real comprehension of the nature of the competition, which nevertheless may have played a significant role in the complex interplay of adaptations and environmental changes leading to the existing situation.

Several snakes and lizards, including species restricted to valleys and others largely confined to mountains or foothills, evidently extended their distributions across the various mountains and valleys in southeastern New Mexico at one time or another. In view of the wide dispersals of some species it is not easy to account for the distributions of others, such as *Coleonyx variegatus, Callisaurus draconoides, Heloderma suspectum,* and *Trimorphodon lambda,* which reach the eastern limits of their distribution in the Peloncillo Mountains. A few species that are largely restricted to the arid regions to the west occur east of this range. Zeller obtained the Sonoran coral snake, *Micruroides euryxanthus,* near Winkler, east of the Animas Mountains, and it is probable that other species will eventually be discovered in the area. Some have apparently entered the area from the east or south. A colony of *Sceloporus poinsetti* discovered in 1953 inhabits an isolated hill 5 miles north of Animas, but there appear to be no authentic records west of the Peloncillos.

That such isolated colonies exist is perhaps fortuitous. Unfortunately several species of snakes are so secretive that prolonged collecting does not necessarily reveal their presence. Robert A. Zeller, while mapping the geological formations in Hidalgo County, incidental to his work with the State Bureau of Mines and Mineral Resources in New Mexico, and later as a private consultant, captured virtually every snake that he encountered and sent it to the American Museum. Though he worked in the area for seven years, he succeeded in collecting but one example of each of the following species: *Ficimia cana* and *Hypsiglena torquata texana* in the Little Hatchet Mountains, *Lampropeltis pyromelana* and *Salvadora grahamiae* in the Animas Mountains, *Salvadora deserticola* from Hat Top Butte east of the Alamo Hueco Mountains, and the specimen of *Micruroides* mentioned above. *Sonora semiannulata blanchardi* was taken at the north end of the Little Hatchet Mountains.

The more widely distributed species in the area, in addition to the larger rattlesnakes of the lowlands, include *Heterodon nasicus kennerlyi, Lampropeltis getulus splendida, Pituophis catenifer affinis,* and *Thamnophis dorsalis dorsalis.* Such species as *Rhinocheilus lecontei tessellatus* and *Arizona elegans philippi,* with activities largely restricted to the hours of darkness, do not appear to be rare in portions of Hidalgo County, but these were not taken by Zeller, whose work was carried on largely during the day.

Four specimens of the Sonoran whipsnake, *Masticophis b. bilineatus,* were all taken in the vicinity of the Animas Mountains, whereas the striped whipsnake, *Masticophis t. taeniatus,* known from Catron County to the north and from Grant County to the northeast, was obtained in the Little Hatchet Mountains and at the headquarters of the Alamo Hueco Ranch. Though often mapped as though their ranges overlapped in the area, it seems probable that the distributions of these two related whipsnakes, like those of *Crotalus viridis* and *Crotalus scutulatus,* are mutually exclusive.

The complex distributional patterns of the reptiles in Hidalgo County, with a curious mixture of faunal elements more characteristic of plains, deserts, or mountains in regions outside the area, are also reflected in the vegetation. Whereas there are extensive areas sparsely covered, largely by creosote bush, *Larrea,* a plant widely distributed in the deserts of Mexico and the American Southwest, other areas have the general aspect of arid regions along the western periphery of the Great Plains. Much of the lowland terrain in Hidalgo County is neither desert nor plains, but a sort of blend of the two. Relatively minor shifts in climatic conditions, even from one year to another, suggest that little change in the general climatic trend might easily have converted these lowland areas into deserts, or with heavier rainfall have transformed them into lush, grass-covered plains.

Though the Animas Mountain region at present is seemingly a barrier to the dispersals of some species and perhaps provides little more than disjunct marginal habitats for others, it may have been an important avenue for the dispersal of several reptiles in the past. Corridors for both lowland and mountain species extend north and south, whereas the low point in the Continental Divide north of the Animas Mountains permitted east-west traffic for (1) species adapted to arid climates during periods of reduced precipitation, or for (2) plains elements during wetter cycles. If such assumptions have validity, the area is currently between the climatic extremes to which it may have been subjected.

Whatever explanation may be offered for the existing complexity in distributions in the region, more detailed studies and additional collections in Hidalgo and the adjacent counties should reveal information of general interest. The region appears to be ideal in many respects for ecological investigations. A comprehensive knowledge of the habitats and microhabitats, even in the absence of detailed information concerning the historical sequence of climatic changes and dispersals, might nevertheless explain why some species have restricted distribu-

tions whereas others do not.

ACKNOWLEDGMENTS

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